TRIP REPORT

Polish Housing Finance Project Office
Construction Cash Flow Model Development
and
Management Information Systems

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TABLE OF CONTENTS

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2 Introduction

The assignment was carried out at the Housing Finance Project Office (HFPO) in Warsaw October 11-29, 1993. The primary objective was to refine the construction project cash flow model developed by Phillip Jones, Thomasz Wiktor, and Richard Quigley, and develop a tamper-proof compiled and executable version of the model suitable for distribution to participating banks and developers. Ancillary tasks supporting the primary objective were to:

- Review the model structure and formulation for mathematical correctness and efficiency.
- Ascertain the utility of the Borland Quattro-Pro spreadsheet for continuing development and improved reporting.
- Develop the capability to extract key management data elements from the model.
- Improve model data entry and reporting.
- Review HFPO MIS development to date by Krzysztif Grabowiecki.
- Review Bud Bank system design and development to date.

In order to carry out the primary objectives of the assignment the Baler spread sheet compiler and the latest version (5) of the Quattro-Pro spread sheet program were purchased[1] and left with the HFPO office for their continuing use.

While I was in Warsaw the World Bank's dual index mortgage (DIM) specialist, Peter Doty, was present. I took the opportunity to familiarize myself with his DIM model and acquire a copy. I worked closely with all the above named individuals, and with Irena Stocka, HFPO Project Manager; Jacak Laszek, Economics Specialist, and Edward Kozlowski, Office Manager.

4 Findings and Actions

4.2 Initial Cash Flow Model Status

The major changes to the cash flow model since June 1993, were:

- the addition of a roster of individual dwelling, garage, and commercial units in each development project,
- the addition of bilingual Polish-English language capability,

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Through my company, International Project Services, I was able to acquire this software at substantial trade discounts.

- automatic assignment of closing month formulas, and
- customized macro driven menus.

The unit roster is a major addition to the model in the form of a data base table incorporated in the spread sheet. Because the model must accommodate varying numbers of units, a sophisticated macro was included to add or delete roster line items. A Quattro Pro version of the model was also developed to take advantage of Quattro Pro's superior graphics output capabilities for presentations.

Bilingual capability was implemented through the macro-driven overlaying of Polish or English named ranges, with duplicate formulas: data entry was performed in the Polish language ranges and referenced in the English ranges. This approach imposed significant complications in calculations, screen displays, and reporting, and made the model logic difficult to analyze.

Analysis of the cash flow model was performed with Quattro Pro 4.0 because of its greater ease of use and built-in audit capability. It should be noted that while Quattro Pro version 4.0 used by the HFPO consultants is compatible with LOTUS, the latest version 5.0, although superior in features and analytical capabilities, is not: because of a lawsuit settlement between Lotus and Borland, Lotus Menus and keypress equivalent macro capability have been removed from Quattro Pro. Hence Baler will not reliably compile spreadsheets using Quattro Pro 5.0. Quattro Pro 5.0 does include a formula compilation capability, but it falls short of the full capability of Baler, and the resulting spread sheet is not executable: it still requires the Quattro Pro program to run.

4.4 Cash Flow Model Refinements and Compilation

The Lotus version of the original model compiled cleanly on the first attempt, with the exception of a circular reference in the closing month algorithm, which Baler resolved automatically by adding new ranges to hold the iterations. The Quattro Pro version also compiled cleanly, but graphic reporting features (e.g. lines, shading, type fonts, label justification, etc.) were lost as these are not compatible with Lotus. With successful compilation of the Lotus version, the HFPO is immediately in a position to disseminate an executable version of the model to participating banks and developers. The model is essentially self documenting, but in my opinion a substantial amount of training will be needed to use the model in the field (see below).

Because compilation was successful so quickly, in conjunction with the HFPO team a number of improvements and refinements to the model were developed. These included:

4.4.2 Bilingual Capability

The existing bilingual logic was replaced with a macro-driven toggle (/L) acting on @IF functions in each label to switch instantaneously between Polish and English from any place in the model. In addition to speeding the language switch, this technique greatly simplified the model's flow and logic, reduced memory requirements by eliminating the substitution of named

ranges, and simplified data entry. Seventy-five percent of the model's original named ranges were eliminated as redundant.

4.4.4 Consolidation of MIS Data

MIS data extraction from the model was developed and implemented in the model, and tested. MIS data (input, calculations, cash flow, unit roster data) was rearranged and consolidated for extraction to the HFPO MIS data base. Extraction of key project input data and calculations was implemented by "printing" the appropriate ranges to ASCII SDF[2] files which are parsed and added to the HFPO MIS data base. The HFPO MIS expert, Krzysztif Grabowiecki, developed the programs to convert this extracted data into the data base formats he had already developed.

4.4.6 Closing Month Algorithm

The elimination of named range substitutions for language switching permitted simplification of the closing month algorithm based on input of the desired closing month in the data entry section of the model, and greater facility in developing "what if..." simulations with varying closing months. The new algorithm incorporates an internal balance to determine the correctness of cash flow and unit roster data entered. The cash flow range is a maximum of 30 months. The circular reference noted above was eliminated by the new calculation.

4.4.8 Unit Roster

Accommodating the unit roster uncovered limitations in both the spread sheet version and the Baler compiled version of the cash flow model. The spread sheet version allowed the utilization of varying numbers of dwelling, garage, and commercial units through a macro capability to add and delete unit roster items up to the maximum that could be accommodated in the personal computer's memory. The memory restriction comes about because the spread sheet program is necessary to execute the model, occupying memory along with the model. In practice, the maximum proved to be about 150 units of all types. Compiling the model with Baler increased the model's unit capacity to 280 units of all types because the executable compiled model is self contained: a separate spread sheet program is not necessary for execution.

However, because the memory boundaries of the model are fixed by the compilation, roster line items cannot be added to or deleted from the compiled model, hence the number of roster line items was fixed at 120 dwelling units, 120 garage units, and 40 commercial units, sufficient to accommodate approximately 80 percent of the projects anticipated under the program. The model's printing macros will be changed to skip the empty roster lines.

System **D**ata **F**ormat is an industry standard ASCII format for transfer of data while maintaining its positional integrity in records.

If this unit quantity restriction proves to be a serious limitation in the future, it appears that the only answer will be to reprogram the model in a procedural language so that it can address external files for cash flow months and units, instead of retaining them in memory.

4.4.10 Features of the compiled model

The Baler compiled cash flow model has several advantages over the spread sheet version:

- It is independently executable: a separate spread sheet program (i.e., Lotus) is not required to execute it.
- All labels, formulas, and calculations are protected from alteration by the user. Only data entry fields can be changed.
- Formulas may be overlaid by absolute values entered by the user, for simulation purposes, and the resulting calculations saved in additional data files. The formulas can then be restored with a menu selection.
- Calculation and language toggling are faster.
- The data capacity (i.e., number of project units) of the model is larger.
- Customized on line help can be included in the model.
- Distribution by version level can be controlled by the HFPO.

The disadvantages of the compiled model are:

- an intrinsic limitation in the size of project that can be handled due to memory constraints implicit in the spread sheet paradigm.
- While graphs internal to the model can be shown on the screen, they cannot be printed by the model: the DOS screen print utility with the DOS GRAPHICS program memory resident must be used.
- Quattro Pro advanced reporting and display capabilities are not accommodated by Baler.

It should be noted that the cash flow model was still not finalized during my time in Warsaw. An additional column was added to the unit roster in mid-October due to recommendations emerging from potential users in meetings with Mr. Quigley, and Mr. Jones felt that additional refinements to the calculations were necessary. Mr. Jones and Mr. Grabowiecki were trained in fundamental Baler operations so that the refinement work could continue.

4.6 HFPO MIS Status

Mr. Grabowiecki has made significant progress in developing the HFPO's MIS. Specifically, he has developed the full data base structure and ancillary data entry, updating, and an initial complement of reporting programs in CLIPPER, version 5.01. I reviewed his work and found it to be quite satisfactory for HFPO's immediate and short term purposes. Two major issues remained to be addressed: collection of construction project application data from the cash flow model, and extraction of monitoring data from the Bud Bank systems.

The first issue was resolved during my assignment in Warsaw: data extraction capability was built into the cash flow model through an additional menu selection, and Mr. Grabowiecki programmed the interface to the HFPO's prototype MIS data base. The extraction and update process was tested and found satisfactory. While the technical interface is done, it remains to establish internal and external procedures for data submission by model users in the HFPO and from external agencies which use the model.

The second issue, acquisition of monitoring data from the Bud Bank, is more difficult, and is addressed below.

4.8 Bud Bank System Development Status

Bud Bank system design and development status was reviewed through meetings with Bud Bank informatics staff, consultants, and management. It was found that design work is essentially complete, and that the data elements specified for management information are incorporated in the design. However no system development (i.e., programming) has actually started.

The Bud Bank has determined to incorporate complete and comprehensive mortgage management in their system, making the system development larger and more complex than is necessary for secondary lending and project management reporting. This decision has been somewhat controversial, but obviously it is the Bud Bank's prerogative to develop their internal systems to meet their perceived needs. It is clear that the time and resources necessary for Bud Bank system development and implementation will be far in excess of those necessary for the Housing Finance Project. In that data for project monitoring is included in the Bud Bank design, and presumably will be periodically extracted and passed to the HFPO, and the HFPO now has the capability to process the data and update their prototype data base, the only remaining issue appears to be when the Bud Bank processing will actually start so that HFPO MIS testing with real data can begin.

In a general management meeting the Bud Bank's resident representative from the Ministry of Construction did express, to me and Peter Doty, her strong opinion that there was no necessity whatsoever to pass data to the HFPO, that such data was none of the HFPO's business, and that she had no idea of what they would do with it. As the MIS specialist I was not in a position to respond beyond directing her to the loan agreements which covered the program. This outburst did, however, point up a potentially serious problem in the MIS area: regardless of technical capabilities which are developing quite satisfactorily in the HFPO, there may be procedural problems in getting monitoring data from the Bud Bank for the HFPO and the lending agencies. In my opinion this issue should be directly addressed by project management in the Polish government and the lending agencies as soon as possible, and the necessary directives to ensure the flow of monitoring data promulgated.

4.10 DIM Model Review

I took advantage of the presence of Peter Doty to acquire and become familiar with a copy of the Lotus based dual index mortgage model. I tested it with Baler, and found that it compiled cleanly, so it is clear that an executable version of this model could be developed and distributed if desired by international development agencies, with respect to any proprietary rights Mr. Doty has to the model.

6 Training Requirements

A substantial amount of training will be required for participating banks and developers to use the cash flow model effectively. Messrs Quigley, Jones and Wiktor advised me that they have found little personal computer and modeling experience among the developers and potential participating banks they've been in contact with. One developer has acquired a copy of an earlier version of the model and become quite proficient with it, but with that exception, all applications of the model have been carried out by the HFPO consultants working with developers.

Training will be needed in three fundamental areas for participating banks and developers: basic personal computer techniques, subject matter area, and model use. Basic personal computer techniques will be essential for users who have had little exposure to personal computers in general, and Lotus in particular. Lotus spread sheet training will be needed because, although the compiled model is secure and executable, it retains the Lotus spread sheet paradigm, and a familiarity with spread sheet processes and operations will be essential for users.

Training in the fundamentals of construction finance and lending will also be needed for users to understand what the cash flow model actually does. The HFPO consultants advised me that the user constituency will have virtually no experience with the type of construction financing used by the program, the terminology will be new and strange to them, and formalized, quantifiable return on investment concepts may be foreign to them.

Finally, training in the use and features of the cash flow model itself will be needed. The model's data entry and menu driven operations are straightforward, but there may be serious problems with terminology and, in particular, with the development of financial numbers to be entered in the unit roster and cash flow sections of the model.

Within the constraints of technical assistance funding it may not be cost effective to provide extensive individual cash flow model training to developers: it may be more cost effective to continue using HFPO consultants or staff to work directly with developers to build their cash flow models on a project by project basis. This approach would also insure that final model data was properly submitted for updating the HFPO MIS data base. The same constraints appear to pertain to participating banks, but it will probably be cost effective to provide the extensive training necessary to selected participating bank staff because it is assumed that the participating banks will be working directly with many developers.

8 Conclusions and Recommendations

With the successful refinement and compilation of the cash flow model, immediate short term conclusions and recommendations are to:

- Revise the Polish labels in the model to include Polish special characters in accordance with the DOS Latin II code page standard.
- Freeze the model and adopt a version level distribution strategy. Mr. Jones is addressing this issue.
- Develop ancillary training materials and documentation in Polish for basic personal computer and spread sheet operations and the construction finance subject matter area.

Longer term issues are:

- Standardize on Lotus as the development base for the spread sheet model so that current Quattro Pro compatibility problems do not complicate development and maintenance.
- Consider redeveloping the model in a procedural language (Xbase, i.e., Clipper or Foxpro, is recommended, to facilitate compatibility with the emerging HFPO MIS). This will remove project size constraints, facilitate maintenance and enhancements, and provide user interface and reporting format improvements.

The progress to date on the HFPO MIS has been very satisfactory. Subject to future refinements which will be inevitable when real data begins to flow, the data base and ancillary updating and reporting programs have been developed to the point where the immediate and short term requirements of the HFPO can be met. It is my understanding that Mr. Grabowiecki's short term concentration will be on supporting Jacak Laszek in the development of a statistical data base for monitoring impact of the housing finance program on the overall housing sector.

The Baler compiler and Quattro Pro version 5 programs were left with the HFPO, and Mr. Jones is working with Baler to continue model refinements. Mr. Grabowiecki should be supplied with the following software to facilitate his continuing MIS and data base development work:

- The latest version of Clipper (currently 5.02)
- Aftermarket Clipper function libraries to include additional mathematical and statistical functions, graphics, and reporting capabilities.
- The “Blinker” high speed linker for compiling Clipper programs.